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gathered by Mr. Stabler on Bowfell which comprises five species of *Marsupella* intermingled in the space of a square inch." Be it remembered that Spruce was a most critical student of these forms.

And, if these are proper examples, what of the numerous species of oaks, willows, thorns, asters, golden-rods and many others which spring up in hosts to challenge our scrutiny? Certainly we should think long before applying the principle advocated by President Jordan to these. And what too, shall we say of the many species of the Siphonææ, the sea-fans, shaving-brushes and their like which grow in the warmer waters of the tropics, many closely related kinds in restricted and identical localities, a condition quite analogous, I venture to say, to the distribution of the oaks, willows, *et cetera*.

It therefore appears that the general law as stated by President Jordan, 'Given any species in any region, the nearest related species is not likely to be found in the same region nor in a remote region, but in a neighboring district separated from the first by a barrier of some sort,' would be more in harmony with the facts in the case as understood by the botanists if stated in the converse form.

President Jordan further admits that, theoretically, mutations may arise which may hold their own in competition with the parent form, but states that such a condition is virtually unknown.<sup>4</sup> This, however, is far from being the case among the plants. Aside from the many properly designated species in cultivation, we have definite, well-authenticated cases of uncultivated forms which give denial.

In 1886, de Vries found in the fields of Hilversum a plant, *Ænothera brevistylis*, which turned out to be a mutant of *O. Lamarckiana*. Although *O. brevistylis* produces comparatively few seeds compared with the parent form, and has not arisen anew as a mutant since the time of its discovery, it has, nevertheless, been able to maintain itself alongside the parent species in the original habitat up till the present time. *O. brevistylis*

may be artificially crossed with the parent form and when this is done the progeny split according to the Mendelian principle, so that, even if this were the means of propagation upon which *O. brevistylis* depends, the race would be maintained.

Without recounting the case of *Capsella Heegeri*, and other well-known instances which are completely authenticated, we may see that it is unwise for us to ignore the probability that the same thing has occurred in nature very many times.

The examples which I have given above are only a few of a thousand which might just as easily be recited and have occurred out of hand to me and to a few of my colleagues whom I have questioned on the matter.

Apropos of the proposition<sup>5</sup> that all the organisms in a region unbroken by barriers will slowly change together in the process of adaptation by nature, I may be permitted to point out that it is again still an open question whether this is the method by which a peculiar flora has attained its apparent uniformity. Curiously enough we find markedly desert types, *e. g.*, *Zyzyphus*, a thorny shrub of the desert, growing chiefly along water courses, and opposite types, as *Verbena ciliata*, which can not be seen to differ from a so-called 'mesophytic' garden weed, ecologically or physiologically, getting along quite well in the habitat of *Cereus giganteus*, the ocotillo (*Fouquieria splendens*) and a lot more specialized enough plants. Similarly we find, for examples, a species of *Opuntia*, *O. Opuntia*, growing in our eastern states associated together with mesophytes, just as we find many mesophytes growing in arid deserts. Why? The answer to this query involves some answer to the problem of the origin of desert floras, one, however, which has not yet been solved.

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#### THE SMALL MOUNDS OF THE UNITED STATES.

IN the two papers on the probable origin of the small mounds in the southern and western parts of the United States, which have ap-

<sup>3</sup> *Rev. Bryologique*, 8: 104. 1881.

<sup>4</sup> *L. c.*, p. 545.

<sup>5</sup> *L. c.*, p. 547.

peared in *SCIENCE* during the present year,<sup>1</sup> the writers have quoted and advanced many and varied theories, none of which, however, appear to be entirely acceptable even by themselves. But why should all these small elevations which evidently occur in large numbers, scattered over widely separated areas between the Mississippi and the Pacific, be considered as having been caused by the same agency? It is impossible to imagine any one natural cause which could have resulted in the formation of all. One theory attributed their origin to glacial action, another considers them to be the work of ants.

Some of the mounds—those in the far north-western part of the country—may be of glacial origin; if so it should not be a difficult question for a competent geologist to determine. But the same theory can not, of course, be applied to those in the lower Mississippi Valley, for the obvious reason that the glaciers did not extend that far south. Likewise the ‘ant hill’ theory, when the mounds are considered as a whole, is as equally inapplicable, not only on account of their wide distribution and occurrence far north, but also by reason of the various soil formations of which they are composed. Were they the work of ants some traces or indications of the cavities and passages would certainly be discernible, but such is not the case. The mounds which I have examined in Missouri show no such indications, and Mr. Branner, referring to those on the Pacific coast, writes:

In California hundreds of mounds have been cut through by railways and by common roads, and many such sections have been examined. The cuttings, being made without any special care exhibit only a compact clayey hard-pan that shows no signs of burrows or anything that has been recognized thus far as different from the soil of the adjacent areas.<sup>2</sup>

Other theories, such as the ‘spring and gas

vent’ and the ‘dune,’ are without foundation and are scarcely worthy of being mentioned.

Both papers to which I have referred mention the mounds as existing as far north as the Arkansas, but do not allude to the numerous groups which occur in Missouri. These are of a similar form and size and the description of one group appears to be applicable to all.

About four years ago I had occasion to excavate many small mounds that stood on the site of the World’s Fair in St. Louis. They formed two groups, one on the ridge, the other not more than six hundred yards distant, was in the lowland on the bank of the small River des Peres. All the mounds of both groups were of a uniform size and were considered as being the same in every respect. But when excavated those on the ridge were found to be ruined habitations. The original surface which served as the floor was readily distinguished. Near the center was the fire bed with ashes and charred wood, worked flint and many small fragments of cloth. Marked pottery were also found on the same level. The mounds of the lower group were likewise examined, but, unlike the others, nothing was found to indicate their origin or use. It will thus be seen that the same theory of origin will not apply to mounds of the same size and appearance when only a third of a mile apart. How unreasonable it is, therefore, to attempt to apply the same theory to those several thousand miles from one another.

I have already mentioned the large groups that exist in Missouri.<sup>3</sup> In Dallas County, in the southern part of the state, they are particularly numerous; many extend in parallel rows along the water courses in the lowlands and others, hundreds, occur in rows on the western slopes, while comparatively few are found on the eastern. Many of these mounds were examined, but nothing was discovered to shed light on their origin; they resembled the lower of the two groups on the fair site, to which I have already referred.

Near the center of one large group of these mounds was one which, although of the same

<sup>1</sup> February 24, 1905, p. 310. A. C. Veatch: ‘The Question of Origin of the Natural Mounds of Louisiana, Arkansas and Texas.’ Also March 31, 1905, p. 514, ‘Natural Mounds or Hog-wallows,’ J. C. Branner.

<sup>2</sup> *SCIENCE*, March 31, 1905, p. 515.

<sup>3</sup> *American Anthropologist*, 1904, p. 294.

size and form, was composed of pieces of limestone, all of which had been carried there. The vegetable mold, the accumulation of a long period of time, had so filled the intervening spaces that the true character of the mound was only revealed when an excavation was made. This mound was between three and four feet in height and about forty feet in diameter. Here we have unquestionable evidence of the work of man. Several other mounds, less than one hundred yards distant, were composed solely of earth and mold similar to the surrounding area.

Probably if these small mounds were not so numerous the question of their origin would never have been raised and they would have been considered, together with the larger mounds, as having been made by man, but the question of number should not influence the decision. It is doubtful if the combined bulk of all these small mounds in the Mississippi Valley is more than equal to that of the one great mound of the Cahokia group.

Without conclusive proof to the contrary, I feel that the most plausible theory of the origin of these small mounds, in Missouri and in other localities where they occur under similar conditions, is that they were made by man, probably to serve as elevated sites for habitations.

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#### SPECIAL ARTICLES.

##### THE LOCH LEVEN TROUT IN CALIFORNIA.

In the year 1896 the State Fish Commission of California sent to Captain H. C. Benson, acting superintendent of the Yosemite National Park, five hundred young trout of the species known as Loch Leven trout, *Salmo levinensis*, to be planted in waters of the park. These were placed in a branch of Alder Creek, near Wawona, where they have been allowed to remain undisturbed until the present year.

This Loch Leven trout has been usually considered as a valid species, distinct from the other trout of Great Britain, distinguished from the common brook trout, *Salmo fario*, by the large size, more silvery color, sparsity

of spots, the red spots and ocelli characteristic of the brook trout, or brown trout, the trout of Izaak Walton, being usually wanting. The orange edge of the adipose fin, characteristic of the brook trout, is wanting in the Loch Leven trout. The mouth in the latter is said to be smaller, and other differences have been pointed out, but the validity of these structural distinctions has been stoutly denied by Surgeon Francis Day, who has made careful studies of the trout of England.

This fall, Captain Benson caught some fifty-four fishes from the branch of Alder Creek, derived from this plant of Loch Leven trout. These varied from two to seven inches in length, but to his surprise and dismay, he found them corresponding exactly to the markings of the English brook trout, called *Salmo fario*, as shown in the figure published by Mr. W. C. Harris. Four fishes, caught by hand in the brook, he sent to me. They are in fact, so far as one can see, exact representatives in form and color of the common brook trout as seen in the streams of England. The adipose fin is edged with orange. The sides are covered with spots of brown mixed with spots of scarlet, more or less ocellated. These Loch Leven trout in the Yosemite are typical *Salmo fario*, or brown trout of England. Dr. Day speaks of the Loch Leven trout as changing into ordinary brook trout, when planted in streams of Gloucester or Guildford, the colors of the Loch Leven trout being seen on exceptionally well-fed individuals only. In Australia, according to Day, fine examples of the Great Lake trout, *Salmo ferox*, weighing twenty pounds have been reared from eggs of *Salmo fario*, taken in Hampshire and Buckingham. Day also notes that 'a Loch Leven trout having been crossed at Howietoun by a salmon-parr, the offspring possessed the orange-tipped adipose dorsal fin which is seen in the young of the sea trout and the brook trout, and it may be asked from whence had such been obtained unless the Loch Leven possessed the blood of one of these races?' The case is exactly parallel with that of the common trout of Japan, *Salmo masou* Brevoort, which is mature at all sizes from three